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Indian Standard
SPECIFICATION FOR WHEELS AND CASTORS
(*First Revision*)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

September 1984

Indian Standard
SPECIFICATION FOR WHEELS AND CASTORS
(First Revision)

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Indian Standard
SPECIFICATION FOR WHEELS AND CASTORS
(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 30 December 1983, after the draft finalized by the Non-powered Materials Handling Equipment Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

0.2 This standard was first published in 1974. This revision takes into account the provisions of the following international standards issued by the International Organization for Standardization (ISO) :

ISO 2175 Industrial wheels for non-powered equipment — Dimensions and nominal load capacities

ISO 2184-1978 Industrial castors — Dimensions of top plates: Part 1—Oblong top plates with 4 bolt holes (Reaffirmed)

ISO 3101-1981 Wheels and castors — Triangular top plates with three fixing holes

ISO 3102-1981 Wheels and castors for non-powered equipment — Off-set for swivel castors

0.3 The provisions of IS : 7261-1974* have been included in this revision to make this standard complete in all respects.

1. SCOPE

1.1 This standard covers dimensions, nominal load capacities and tests required for industrial wheels and castors, both fixed and swivel type used for non-powered, manual or towed equipment.

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*Dimensions of top-plates for castors.

1.1.1 This standard does not cover household or institutional castors.

1.2 This standard also specifies the main dimensions and off-set distances of the top-plates for castors, both rectangular and triangular.

2. TERMINOLOGY

2.1 For the purpose of this standard the terms and definitions, in addition to the following, given in IS : 6839 (Part 1) - 1973* shall apply.

2.2 Nominal Load Capacity — The maximum permissible loading during use to which an industrial wheel may be subjected on a horizontal, even hard and non-deformable ground surface on which there are no obstruction at a speed of 6 km/h and at ambient temperature of 20± 10°C.

3. WHEELS

3.1 Classification

3.1.1 The wheels are classified into four categories A, B, C, and D according to the increasing values of the nominal load capacity for the main dimensions (hub diameter and length) of the wheels, taking the material of the tread, its dimensions and the operating conditions into account (*see* Table 1).

Example : For a wheel of 200 mm diameter, and 60 mm hub length, the categories A, B, C, and D prescribe the following nominal load capacities :

Category	A	B	C	D
Nominal load capacity, kg	160	250	400	630

3.1.2 When the nominal load capacity mentioned by the manufacturer falls between the values of two consecutive categories the wheel is classified into the lower category.

3.2 Material

3.2.1 The following materials may be used for manufacturing the wheels :

a) Rubber,
b) Cast iron,
c) Polypropylene,

---

*Glossary of terms relating to non-powered materials handling equipment : Part 1 Castors and wheels.

d) Nylon,

e) Bakelite,

f) Polyurethane,

g) Laminated fibre,

h) Mild steel, and

j) High density polyethylene.

3.3 Dimensions — The wheel diameter, hub length and the bore size shall be as given in Table 1.

3.3.1 The wheel bore is the nominal diameter '*d*' of the hole machined in the hub or nominal inner diameter of the bearings to receive the axle (*see* Figure in Table 1).

3.4 Tolerances

3.4.1 Tolerance on the wheel diameter '*d*' up to and including 100 mm shall be ± 2 mm and for the diameters greater than 100 mm shall be ± 2 percent.

3.4.2 Tolerance on the hub length '*L*' up to and inclusive of 90 mm shall be $^{+0}_{-2}$ mm and for length of 120 mm it shall be $^{+0}_{-4}$ mm.

3.4.3 The tolerance on the bore shall be as per IS : 2102-1969*.

3.5 Designation — Wheels shall be designated by its nominal diameter (*D*) hub length (*L*), bore size nominal load capacity (*Q*) of the category to which the wheel falls and the number of this standard.

Example : A wheel of nominal wheel diameter 80 mm, hub length 45 mm, bore size 12 mm and with a nominal load capacity 63 kg, shall be designated as follows :

80×45×12–63 kg IS : 7369

3.6 General

3.6.1 If the wheel includes washers, or seals located within the hub they shall not protrude outside the hub.

3.6.2 When the wheels are axle mounted, the hub length shall be selected so that this length increased by length of any spacers, is larger than the overall width of the rim or of the tyre. The minimum value

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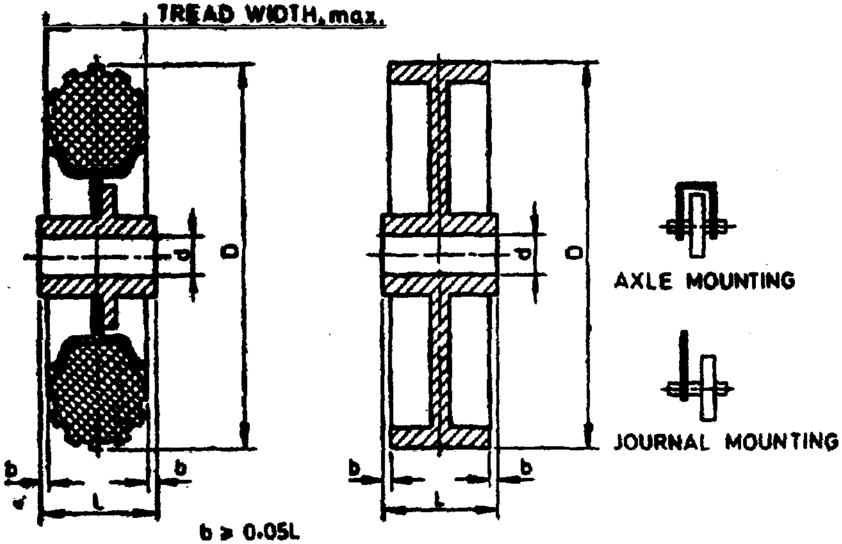
*Allowable deviations for dimensions without specified tolerance (*first revision*).

TABLE 1 NOMINAL LOAD CAPACITIES OF WHEELS

(*Clause* 3.3)



All dimensions in milimetres.

Wheel Dia *D*	Hub Length *L*	Category A			Category B			Category C			Category D		
		Bore *d*		Load *Q* kg	Bore *d*		Load *Q* kg	Bore *d*		Load *Q* kg	Bore *d*		Load *Q* kg
		Axle Mounting	Journal Mounting		Axle Mounting	Journal Mounting		Axle Mounting	Journal Mounting		Axle Mounting	Journal Mounting	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
50	30	10	—	30	10	—	40	10	—	50	10	—	63
63	30	10	—	40	10	—	50	10	—	63	10	—	80
80	30	10	—	40	10	—	50	10	—	63	10	—	80
	45	12	—	50	12	—	63	12	—	80	12	—	100

100	30	10	—	40	10	—	50	10	—	63	10	—	
	45	12	—	63	12	—	80	12	—	100	12	—	125
125	45	12	20	80	12	20	100	12	20	125	12	20	160
	60	20	25	100	20	25	160	20	25	250	20	25	400
150	45	20	20	100	20	20	125	20	20	160	20	20	200
160	60	20	25	125	20	25	200	20	25	320	20	30	500
200	45	20	20	125	20	20	160	20	20	200	20	20	250
	60	20	25	160	20	25	250	20	25	400	20	30	630
	90	25	30	250	25	30	400	25	35	630	25	40	1 000
	120	—	30	320	—	35	500	—	40	800	—	50	1 250
250	60	25	25	200	25	25	320	25	30	500	25	35	800
	90	25	30	320	25	35	500	25	40	800	25	50	1 250
	120	—	30	400	—	35	630	—	40	1000	—	50	1 600
300	60	25	25	200	25	25	320	25	30	500	25	35	800
	90	25	30	400	25	35	630	25	40	1000	25	50	1 600
	120	—	35	500	—	40	800	—	50	1250	—	50	2 000
350	90	25	30	400	25	35	630	25	40	1000	25	50	1 600
	120	—	35	500	—	40	800	—	50	1250	—	50	2 000
400	90	25	30	400	25	35	630	25	40	1000	25	50	1 600
	120	—	35	500	—	40	800	—	50	1250	—	50	2 000
500	90	25	35	500	25	40	800	25	50	1250	25	50	2 000
	120	—	35	630	—	40	1000	—	50	1600	—	60	2 500

NOTE 1 — If the speed of the wheels is over 6 km/h and up to 25 km/h, the nominal load capacity should be reduced in relation to increase of speed.

NOTE 2 — Wheels having a bore for journal mounting may also be axle mounted.

NOTE 3 — Dimensions other than given in this Table are permissible, if agreed to between the manufacturer and the purchaser, for a transition period of 4 years.

of symmetrical excess '*b*' (*see* Table 1) shall be equal to 5 percent of the hub length.

3.6.3 *Selection of Wheels* — Loads on the wheels of a material handling equipment may be determined in advance by considering the useful load and assuming that the dead weight of the handling equipment itself might reach up to 25 percent of the useful load, the total load being equally distributed on the wheel.

Example : Load per wheel for a 4-wheel truck having a useful load of 800 kg :

$$\frac{800 \times 1{\cdot}25}{4} = 250 \text{ kg}$$

When the load calculated either in this manner or by taking into account the actual dead weight and the precise distribution of the loads on the wheels does not correspond to one of the loads mentioned in Table 1, it is necessary to use a wheel intended for the next higher nominal load capacity.

4. CASTORS

4.1 Type of Castors

4.1.1 The castors shall be of the following two types :

a) Fixed castors, and
b) Swivel castors.

4.2 Top-Plates for Castors

4.2.1 The dimensions of rectangular and triangular top-plates shall be in accordance with Tables 2 and 3, respectively.

4.2.2 The design of the outer profile of top-plates is left to the manufacturer within the maximum envelope size ($A \times B$) as given in Table 2.

4.2.3 The bolt hole spacings a and b (*see* Table 2) shall be in a ratio close to 4 : 3. The bolt holes may be oblong but their dimension, that is width, shall correspond to the diameters as given in Table 2.

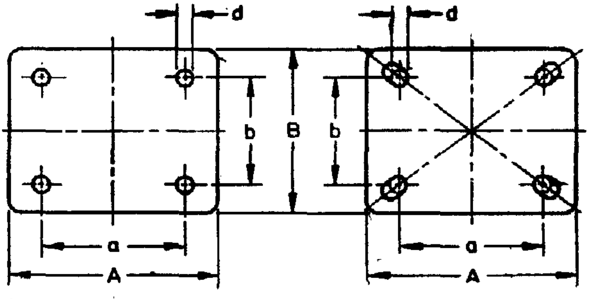
4.2.4 The diameters d of the bolt holes shall be selected from IS : 1363-1967*. The bolt holes may be oblong and have any dimension in length, but the dimensions in width shall correspond to the diameters given in Table 2.

---

*Specification for black hexagon bolts, nuts and lock nuts (dia 6 to 39 mm) and black hexagon screws (dia 6 to 24 mm) (*first revision*).

TABLE 2 CLASSIFICATION AND DIMENSIONS OF RECTANGULAR TOP-PLATES

(*Clauses* 4.2.1 *and* 4.2.2)



ROUND BOLT HOLES

OBLONG BOLT HOLES

All dimensions in millimetres.

CLASS No.	MAXIMUM DIMENSIONS OF TOP PLATES	BOLT HOLE SPACINGS	BOLT HOLE DIAMETER	CORRESPONDING WHEELS	
				Wheel Diameter	Hub Length
	$A \times B$	$a \times b$	d	D	L
(1)	(2)	(3)	(4)	(5)	(6)
1	75×60	55×40	7	50	30
				63	
2	115×85	80×60	9	80	30
				100	
				80	
				100	45
				125	
3	145×110	105×80	11	150	
				160	45
				200	
				125	
				150	60
				160	
				200	

(*Continued*)

TABLE 2 CLASSIFICATION AND DIMENSIONS OF RECTANGULAR TOP-PLATES — *Contd*

Class No.	Maximum Dimensions of Top Plates	Bolt Hole Spacings	Bolt Hole Diameter	Corresponding Wheels	
				Wheel Diameter	Hub Length
	$A \times B$	$a \times b$	d	D	L
(1)	(2)	(3)	(4)	(5)	(6)
4	175×140	140×105	14 (11)*	250	60
				300	
5	200×160	160×120	16 (14)*	200	
				250	
				300	90
				350	
				400	
				500	
6	255×205	210×160	18 (16)*	200	90 or 120
				250	
				300	
				350	
				400	
				500	

NOTE 1 — Tolerance on bore shall be according to IS : 2102-1969 Allowable devitions for dimensions without specified tolerance (*first revision*).

NOTE 2 — Dimensions other than given in this table are permissible if agreed to between the manufacturer and the purchaser for a transition period of 4 years.

*For some light built top-plates (for instance, stamped sheet iron top-plates) the smaller diameters are accepted.

4.3 Off-Set Dimension

4.3.1 The off-Set distance for swivelling castors shall be in accordance with Table 4.

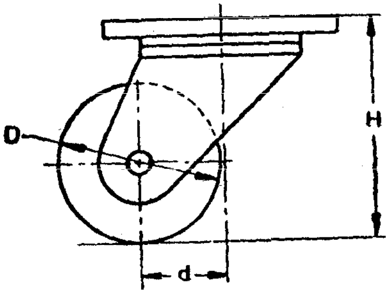
5. WORKMANSHIP

5.1 General — Castors shall be clean and properly assembled. Burrs and sharp edges shall be removed. Parts shall not be damaged or impaired in any way. Parts shall not show evidence of rust or corrosion.

5.2 Bolt Mounting — Bolt holes shall be accurately punched, drilled or reamed and shall have burrs and sharp edges removed. The face of the mounting bolt head or washer shall make full contact with the surface of the mounting plate.

TABLE 3 DIMENSIONS OF TRIANGULAR TOP-PLATES

(*Clause* 4.2.1)



All dimensions in millimetres.

CLASS No.	MAXIMUM DIMENSIONS OF TOP PLATES $A \times A$	MAXIMUM SPACING OF FIXING HOLE CENTRES a	DIAMETER OF FIXING HOLE OR WIDTH OF SLOT D	MINIMUM CENTRE DISTANCE IN SLOTS L
(1)	(2)	(3)	(4)	(5)
1	75×75	55	7	5
2	115×115	80	9	11
3a	145×145	105	9	11
3b	145×145	105	11	9
4a	175×175	140	11	17
4b	175×175	140	14	14

5.3 Welded Joints — Welding shall be wound, free from all visual defects and shall be thoroughly fused to the parent metal.

5.4 Riveted Joints — Rivet holes shall be accurately punched or drilled and shall have burrs and sharp edges removed. Rivets shall be of sufficient strength and riveted in a manner to comply with the rating without showing excessive wear, distortion or permanent deformation.

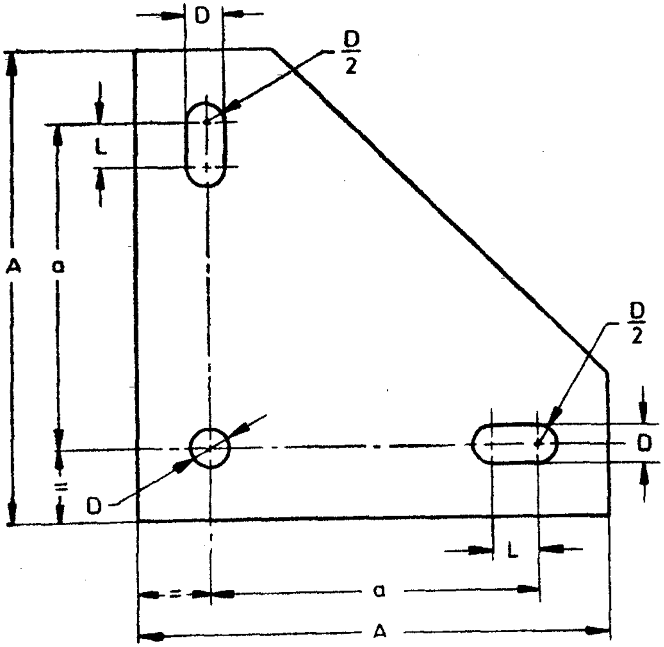
5.5 Castings — Castings shall be of uniform quality and condition, free from blow-holes, porosity, hard spots, shrinkage or cracks.

5.6 Swivel Castors — Swivel castors shall swivel freely and smoothly, without binding, a full 360 degrees in both clockwise and anti-clockwise directions.

5.7 Wheels — Wheels shall be free to rotate without binding on the axle or surrounding assembly.

TABLE 4 OFF-SET FOR SWIVELLING CASTOR

(*Clause* 4.3.1)



All dimensions in millimetres.

Diameter of Castor *D*	Height of Castor *H*	Off-Set *d*	
		Maxium	Minimum
50	70	30	At least 20 percent of castor diameter *D*
63	85	40	
80	110	50	
100	135	60	
125	170	70	
150	205	80	
160	220	85	
200	275	100	
250	340	115	
300	410	130	
350	480	140	
400	550	150	
500	685	170	

Note 1 — Beginning from diameter 250 mm, the maximum value of off-set of castors fitted with a suspension system may be increased to 55 percent of the castor diameter.

Note 2 — Dimensions other than given in this table are permissible if agreed to between the manufacturer and the purchaser for a transition period of 4 years.

5.8 Tyres — When fitted, tyres shall be free from any defect which might cause premature failure or removal from the wheel.

5.9 Bearings — Plain metal bearings shall not have foreign materials on bearing surfaces. Bearing races, balls and rollers where fitted shall be of good quality.

6. TESTS FOR WHEELS AND CASTORS

6.1 Load Test

6.1.1 Any industrial wheel or castor shall pass, without abnormal wear or permanent deformation prejudicial to its good use, the load tests which shall be carried out in the following conditions :

a) test load constituted of the actual mass corresponding to the nominal load capacity defined in **2.2** connected to the wheel or castor to be tested and positioned on top of it;

b) at a speed of 6 km/h;

c) at an ambient temperature 20±10°C;

d) on a hard and horizontal surface of travelling;

e) with obstacles of hard material, having a rectangular section of 100 mm width, with one edge rounded to 2·5 to 5 mm radius, positioned slantwise, alternately to right and left at 45° in relation to the travel axis, and having a height of :

    a) 5 percent of the wheel diameter for wheels with soft tread (shore hardness A $\leqslant$ 90);

    b) 2·5 percent of the wheel diameter for wheels having a hard tread (shore hardness A $>$ 90);

f) the number of obstacles to be negotiated shall be 500, separated from each other by 1 m minimum and 3 m maximum; and

g) the test may include stops under load, the total time not to exceed 25% of the duration of the test including stops. The maximum duration of one cycle should be 4 min (3 min travel, 1 min stop).

Note — When the service conditions differ from those specified in this standard (speed/height and spacing obstacles, traffic intermittence, temperature. etc), the nominal load capacity should be decreased or increased according to the data supplied by the manufacturer.

For example, the wheels of industrial trailers may travel at speeds higher than 6 km/h (up to 25 km/h maximum) on bad ground; their nominal load capacity should therefore be reduced according to speed, and also according to the other conditions of use.

7. SAMPLING OF WHEELS AND CASTORS

7.1 In any consignment all the castors of the same type, class and manufactured from the same material under essential similar conditions of manufacture shall be grouped together to constitute a lot.

7.2 For ascertaining the conformity of the lot to the requirements of the specification, tests shall be carried out for each lot separately. The number of castors to be selected at random for this purpose shall be in accordance with col 1 and 2 of Table 5.

TABLE 5 SCALE OF SAMPLING AND PERMISSIBLE NUMBER OF DEFECTIVES

No. of Castor in the Lot (1)	No. of Castors in the Sample (2)
Up to 50	3
51 to 150	5
151 to 500	8
501 to 3 000	13
3 001 and above	20

7.3 The castors selected according to **7.2** shall be examined for dimensions, tolerances (*see* **3.3** and **3.4**) and workmanship (*see* **5**). If none of the castors fails to meet one or more of the requirements mentioned above, the lot shall be declared to be conforming to the requirements of these characteristics.

7.4 If the lot is found satisfactory according to **7.3**, then these castors shall be subjected to swivel test (*see* **5.6**), load test (*see* **6.1**).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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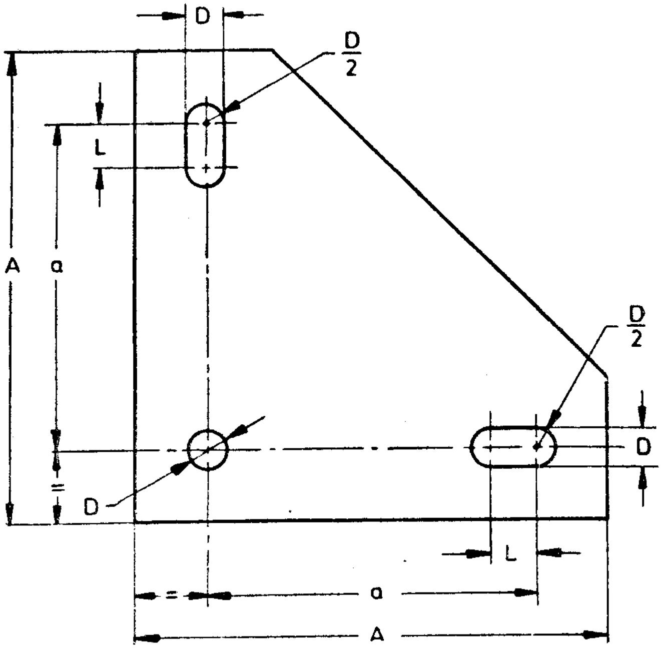
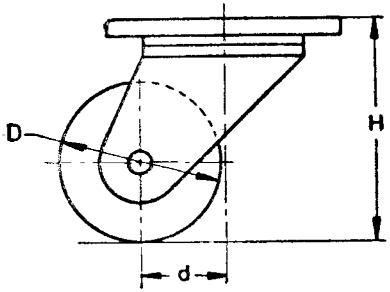
(*Page* 11, *figure in Table* 3) — Substitute the following for the existing figure:



(*Page* 12, *figure in Table* 4) — Substitute the following for the existing figure:



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